

REMARKS

The present remarks are in response to the Examiner's Office Action mailed August 3, 2007. Claims 1-26 are now pending of which claims 6-24 and 26 are withdrawn.

Reconsideration of the application is respectfully requested in view of the following remarks. For the Examiner's convenience and reference, Applicant's remarks are presented in the order in which the corresponding issues were raised in the Office Action.

Please note that the following remarks are not intended to be an exhaustive enumeration of the distinctions between any cited references and the claimed invention. Rather, the distinctions identified and discussed below are presented solely by way of example to illustrate some of the differences between the claimed invention and the cited references. In addition, Applicants request that the Examiner carefully review any references discussed below to ensure that Applicants understanding and discussion of the references, if any, is consistent with the Examiner's understanding.

I. PRIOR ART REJECTIONS

A. Rejection Under 35 U.S.C. § 103

The Examiner rejects claims 1-5 and 25 under 35 U.S.C. § 103 as being unpatentable over *Monson et al.* (U.S. Patent No. 7,135,704). Applicants traverse the Examiner's rejection for obviousness on the grounds that *Monson* is not within the scope of what may be considered as "prior art" relative to the present invention.

Monson was filed on August 14, 2003, was published on February 17, 2005, and issued on November 14, 2006. This application was filed on August 3, 2007 and claims the benefit of U.S. Provisional Patent Application Serial No. 60,422,805 filed on October 30, 2002. A copy of U.S. Provisional Patent Application Serial No. 60,422,805 has been attached hereto for the Examiner's convenience. Claims 1-5 and 25 find support in U.S. Provisional Patent Application Serial No. 60,422,805 and are therefore entitled to the same filing date. As claims 1-5 and 25 are entitled to a filing date prior to *Monson*'s filing date *Monson* is not within the scope of what may be considered "prior art" and the Applicant respectfully requests that the rejection of claims 1-5 and 25 be withdrawn for at least this reason.

CONCLUSION

In view of the foregoing, Applicants believe the claims as amended are in allowable form. In the event that the Examiner finds remaining impediment to a prompt allowance of this application that may be clarified through a telephone interview, or which may be overcome by an Examiner's Amendment, the Examiner is requested to contact the undersigned attorney.

Dated this 12th day of December, 2007.

Respectfully submitted,

/David A. Jones/ Reg. 50,004

DAVID A. JONES

Registration No. 50,004

Attorney for Applicant

Customer No. 022913

Telephone: (801) 533-9800

APPENDIX A

Copy of U.S. Provisional Patent Application Serial No. 60,422,805 filed October 30, 2002

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10/30/02

11-01-02 07:22:05 - 10:41:00 A/PFOV

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modified
PTO/SB/16(8-00)

PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION under 37 CFR 1.53(c).

Docket Number:		20600-07096	
INVENTOR(S)			
Given Name (first and middle (if any))	Family Name or Surname	Residence (City And Either State Or Foreign Country)	
Fang-Zhong Wei John Chun Robert	Chen Cai Chen Lei Shih	Monterey Park, California Arcadia, California Rowland Heights, California Arcadia, California Arcadia, California	
<input type="checkbox"/> Additional inventors are being named on separately numbered sheets attached hereto.			
TITLE OF THE INVENTION (500 characters max.)			
LASER BURN-IN TESTING			
CORRESPONDENCE ADDRESS			
Direct all correspondence to:			
<input checked="" type="checkbox"/> Customer Number	00758	→	
ENCLOSED APPLICATION PARTS (check all that apply)			
<input checked="" type="checkbox"/> Specification	No. of Pages: 6	<input checked="" type="checkbox"/> Return Postcard	
<input checked="" type="checkbox"/> Drawing(s)	No. of Sheets: 4	<input type="checkbox"/> CD(s), Number	
<input type="checkbox"/> Application Data Sheet See 37 CFR 1.76		<input type="checkbox"/> Other (specify)	
METHOD OF PAYMENT (check all that apply)			
<input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27			
<input checked="" type="checkbox"/> Fee Transmittal Form Enclosed (in duplicate)		<input checked="" type="checkbox"/> Check Enclosed	
The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.			
<input checked="" type="checkbox"/> No.			
<input type="checkbox"/> Yes, the name of the U.S. Government Agency and the Government contract number are: _____			
SIGNATURE OF ATTORNEY OR AGENT			
Signature:			
Attorney/Reg. No.:	Edward A. Van Gieson / Reg. No.: 44,386	Dated:	Oct 30, 2002
CERTIFICATE OF MAILING			
I hereby certify that this correspondence is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service pursuant to 37 CFR 1.10 in an envelope addressed to: Box Provisional Patent Application, Commissioner for Patents, Washington, D.C. 20231 on the date shown below.			
Signature:			
Typed or Printed Name:	Edward A. Van Gieson	Dated:	Oct 30, 2002
Express Mail Mailing Number:	EL 946445898 US		

JC979 U.S. PTO
60/422805

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USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

20600/07096/DOCS/1307308.1

60422305 . 103002

PTO/SB/17 (10-01)(modified)

OMB 0651-0032

Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

0002/PTO(modified) Rev. 10/2001	U.S. Department of Commerce Patent and Trademark Office	Complete if Known <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td>Application Number</td> <td>Not yet known</td> </tr> <tr> <td>Filing Date</td> <td>October 30, 2002</td> </tr> <tr> <td>First Named Inventor</td> <td>Fang-Zhong Chen</td> </tr> <tr> <td>Group Art Unit</td> <td>Not yet known</td> </tr> <tr> <td>Examiner Name</td> <td>Not yet known</td> </tr> <tr> <td>Attorney Docket Number</td> <td>20600-07096</td> </tr> </table>	Application Number	Not yet known	Filing Date	October 30, 2002	First Named Inventor	Fang-Zhong Chen	Group Art Unit	Not yet known	Examiner Name	Not yet known	Attorney Docket Number	20600-07096
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SUBMITTED BY		Complete (if applicable)	
Typed or Printed Name	Edward A. Van Gieson	Reg. Number	44,386
Signature		Date	Oct 30, 2002

20600/07096/DOCS/1307310.1

[†] Request for Extension of Time per 37 CFR 1.136 (a)(3) made hereby

LASER BURN-IN TESTING

Inventors: Fang-Zhong Chen, Wei Cai, John Chen, Chun Lei, and Robert Shih

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates generally to testing of laser diodes.

2. Description of Background Art

[0002] Burn-in procedures are commonly utilized in laser diode manufacturing. Commonly, laser diodes are tested at an elevated ambient temperature for an extended period of time to assess how the lasers degrade over time. For example, a burn-in procedure may be used to screen out infant mortality and to estimate long-term reliability.

[0003] Conventionally, lifetesting of laser diodes involves periodically testing the laser diodes at room temperature. For example, in a 1000 hour test the lasers may be operated at elevated temperature but removed every 50-100 hours to test individual lasers.

[0004] A drawback of conventional lifetesting is that it is labor intensive. Therefore, what is desired is an improved apparatus and method for lifetesting laser diodes.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] FIG. 1 is a plan view of a burn-in rack having a burn-in board for holding laser diodes.

- [0006] FIG. 2 is a plan view of a test apparatus having a detector array.
- [0007] FIG. 3 illustrates a burn-in rack inserted into the test apparatus.
- [0008] FIG. 4 is a flow chart one method of lifetesting.
- [0009] FIG. 5 is a flow chart illustrating another method of lifetesting.
- [0010] The figures depict a preferred embodiment of the present invention for purposes of illustration only. One of skill in the art will readily recognize from the following discussion that alternative embodiments of the structures and methods disclosed herein may be employed without departing from the principles of the claimed invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0011] The present invention generally comprises an apparatus and method for lifetesting laser diodes. Referring to FIG. 1, a burn-in rack 100 comprises a board 105 having a plurality of holders 120 for laser diode packages, such as lasers packaged in TO packages. Signal buses 115 permit electrical signals to be coupled to an electrical connector 110 and laser diodes mounted in holders 120. A handle 150 may be included to facilitate moving the burn-in rack into a burn-in oven. FIG. 1 shows a small number of holders 120 for the purposes of illustration, however in some embodiments 50 or more holders are included on the burn-in rack. The holders are preferably arranged as an array or other efficient arrangement for placing laser diodes on a board.

[0012] Referring to FIG. 2, in the present invention a test apparatus 200 includes an arrangement of optical detectors 220 having the same spatial relationship as the holders 120 of the burn-in rack 100. The optical detectors are preferably calibrated optical detectors. Each optical detector is electrically coupled, such as by a signal bus 215, to an electrical connector 220. A frame (not shown in FIG. 2) is preferably included in the test

apparatus 200 to permit the burn-in rack 100 to be mounted with laser diodes in close proximity to detectors 220. In one embodiment the frame is configured to permit the burn-in rack to be slid into place.

[0013] FIG.3 illustrates the use of the test apparatus as part of a lifetesting system. An entire burn-in rack 100 with mounted laser diodes is placed onto frame 290. Light from each laser diode mounted to the burn-in rack will be received by a corresponding optical detector of test apparatus 200. In one embodiment, a computer 305 is communicatively coupled to the lasers and the detectors via electrical connectors 110 and 220. Computer 305 may, for example, include associated signal drivers and detectors appropriate for the laser diodes and detectors. Computer 305 may test each laser, such as by performing a L-I (light power versus current) analysis using the detectors in test apparatus 200 to detect light power. In one embodiment computer 305 test each laser diode in a sequence until it has tested all of the laser diodes.

[0014] Packaged laser diodes sometimes also include an internal monitor photo-diode. In some embodiment, computer 305 also monitors the output of the monitor photo-diode as well.

[0015] Computer 305 may display the results of a test on a computer screen. Additionally, test results may also be stored, such as on the memory of the computer, for later use during lifetesting.

[0016] FIG. 4 illustrates one method of using the test apparatus. In one embodiment, a burn-in board having a plurality of laser diodes is mounted 405 to the test apparatus. Each laser diode is characterized 410 using the optical detectors of the test apparatus. The characterization data is preferably stored 420 for later use. A decision is made 430 whether the lasers on the burn-in board require additional burn-in at elevated

temperature. If the lasers require more burn-in, the entire burn-in board may be inserted 440 into a burn-in oven for a preselected time and temperature. The process may be cycled for a selected number of iterations until the lasers have been burned for the desired length of time.

[0017] FIG. 5 illustrates another method of using the test apparatus. A burn in board with laser diodes is mounted 505 onto the test apparatus. The laser diodes are characterized 510 using the calibrated optical detectors of the test apparatus. Each laser diode is also characterized using its own integrated monitor detector 515. Each integrated monitor detector is then calibrated 520 using the characterization data from the calibrated optical detectors of the test apparatus. This may, for example, include using measured power levels to determine the mathematical relationship between an output current or voltage of the monitor detectors and the actual output power levels. This calibration process is of general interest as characterization data for end users but may also be used in later lifetesting. The burn-in board may then be removed and placed in a burn-in oven 525. The monitor detectors of each laser may then be used to characterize the lasers during further lifetesting 530. In some embodiments, this permits, for example, further periodic testing of the laser diodes at room temperature using the monitor detectors. Additionally, useful information on laser degradation may also be acquired during elevated temperature testing using the calibrated monitor diodes.

[0018] One benefit of the present invention is that it reduces labor cost. Once laser diodes are mounted onto the holders of a burn-in rack they may be left in place throughout subsequent lifetesting. For example, with a laser burn-in rack with 50 laser diodes it may be desired to monitor the L-I degradation of the laser at periodic intervals, such as every 100 hours during an extended lifetest. Conventionally, during each test

interval all of the laser diodes would have to be removed from the burn-in rack, individually tested, and returned to the burn-in rack. In the present invention, the laser diodes can be left on the burn-in rack and tested, reducing labor cost. Additionally, in embodiments in which the test apparatus is used to calibrate the monitor detectors of the lasers, the laser diodes can be characterized using the monitor detectors.

[0019] While particular embodiments and applications of the present invention have been illustrated and described, it is to be understood that the invention is not limited to the precise construction and components disclosed herein and that various modifications, changes and variations which will be apparent to those skilled in the art may be made in the arrangement, operation and details of the method and apparatus of the present invention disclosed herein without departing from the spirit and scope of the invention as defined in the appended claims.

CLAIMS

What is claimed is:

- 1 1. A system for lifetesting lasers, comprising:
 - 2 a burn-in rack having a plurality of laser diode holders and electrical signal
 - 3 connectors for coupling laser diodes mounted in the holders to a first electrical connector;
 - 4 a test apparatus configured to hold the burn-in rack and having optical
 - 5 detectors arranged to receive light from laser diodes mounted to the burn-in rack and
 - 6 couple output signals from the optical detectors to a second electrical connector;
 - 7 a computer coupled to the electrical connectors for testing laser diodes, the
 - 8 computer determining a drive current supplied to each laser and measuring the light
 - 9 output from the optical detectors.
- 1 2. A computer controlled method of characterizing laser diodes, comprising:
 - 2 mounting a burn-in rack of laser diodes to a test apparatus having an array of
 - 3 optical detectors;
 - 4 providing a drive current to each laser;
 - 5 measuring the optical power output of the lasers using the optical detectors;
 - 6 and
 - 7 storing optical characterization data for the lasers.

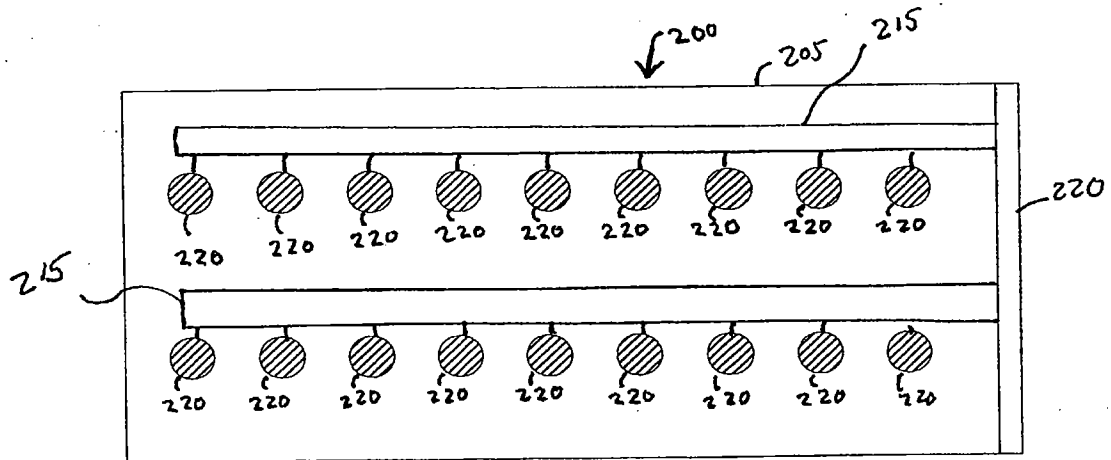
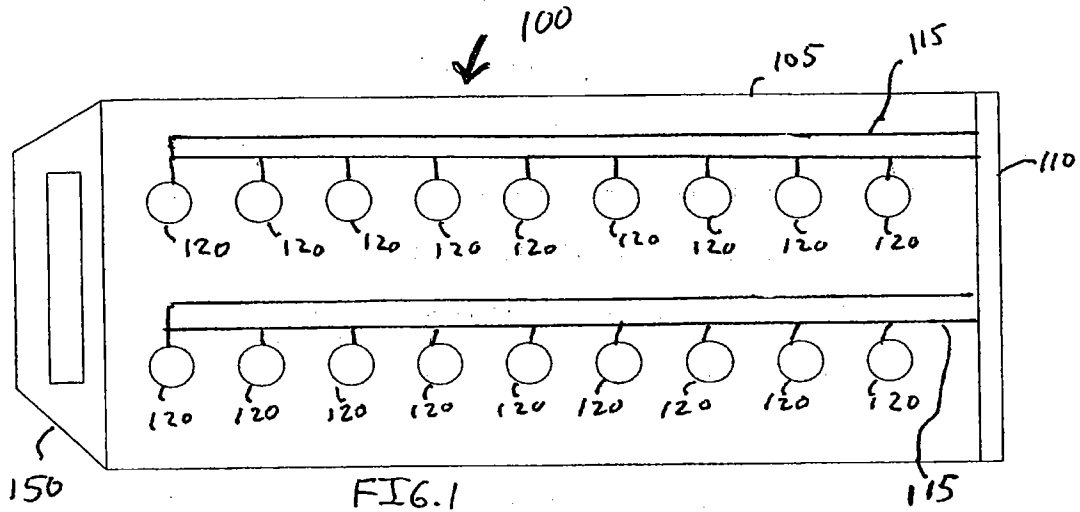


FIG. 2

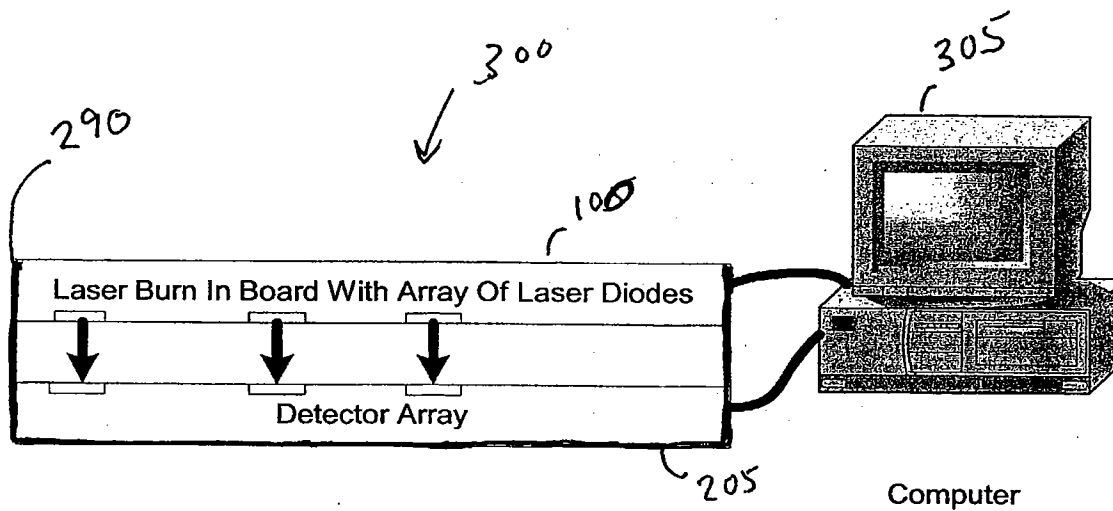


FIG. 3

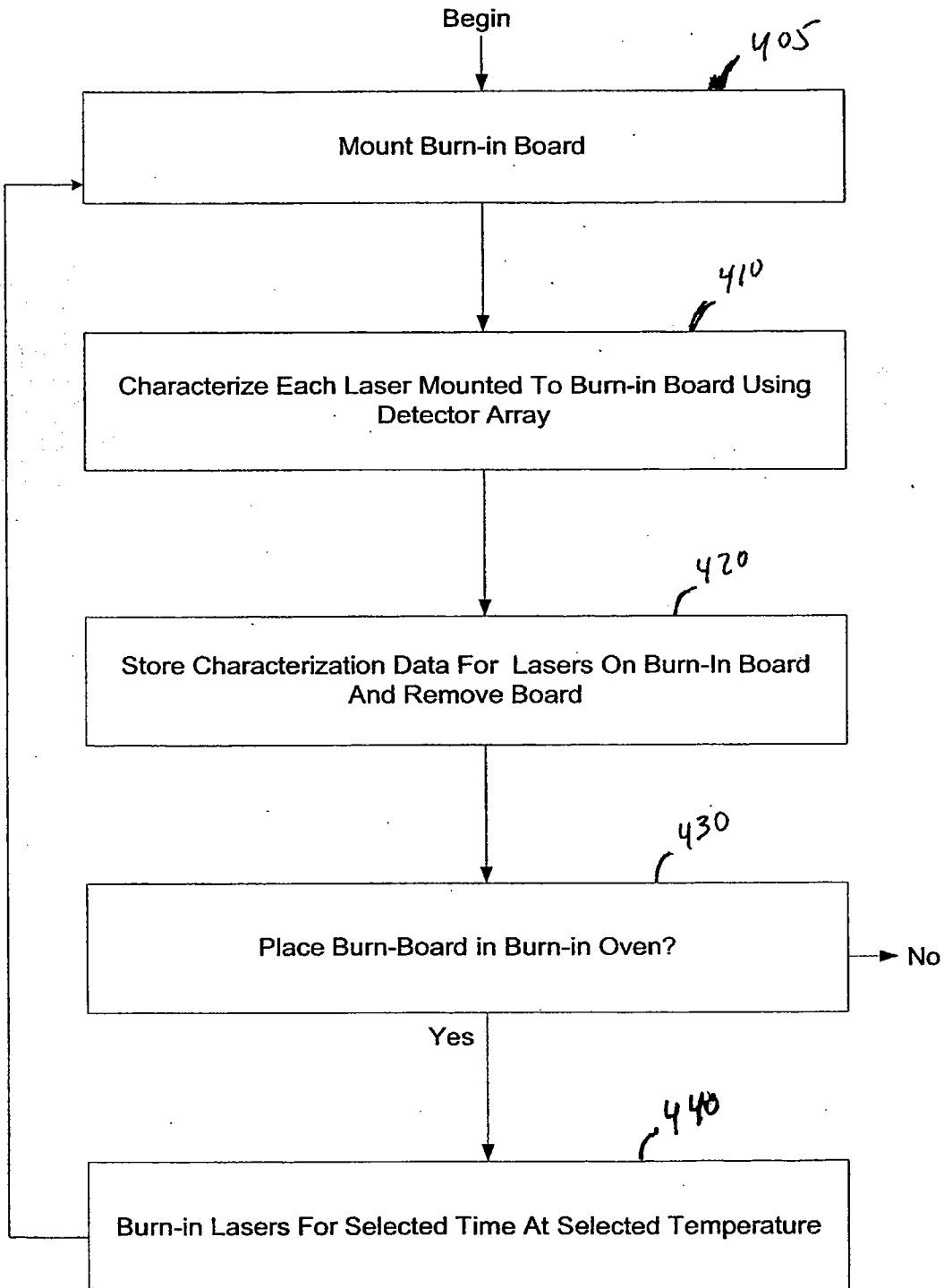


FIG. 4

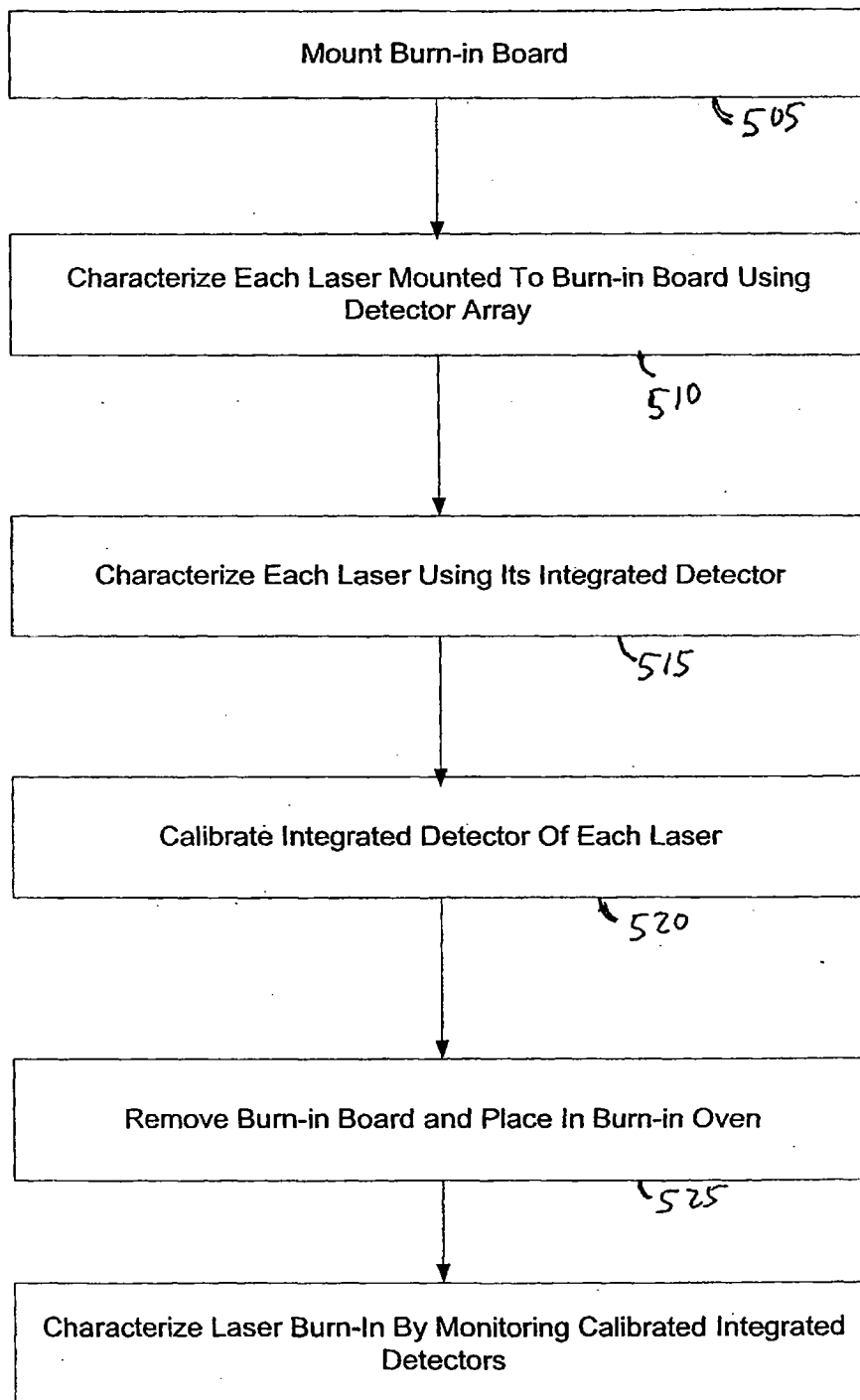


FIG. 5